缓动

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EASING EQUATIONS

http://www.robertpenner.com/easing.html

什么是运动

- 时间
- 位置

位置是时间的函数，在任意指定的时间，运动都有确定的数值。

匀速运动

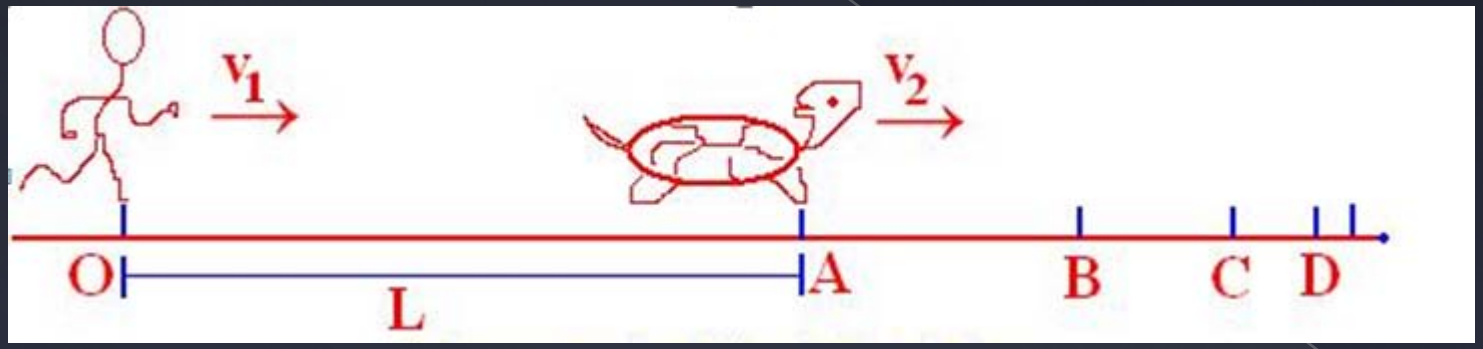
- 机械
- 僵硬
- 看起来太假了

缓动

- 缓入 (ease-in)
- 缓出 (ease-out)
- 缓入缓出 (ease-in-out)

标准指数滑动

- 庄子：一尺之棰，日取其半，万世不竭
- 芝诺悖论(Zeno‘s paradoxes)：阿喀琉斯跑不过乌龟



变形的关键因素

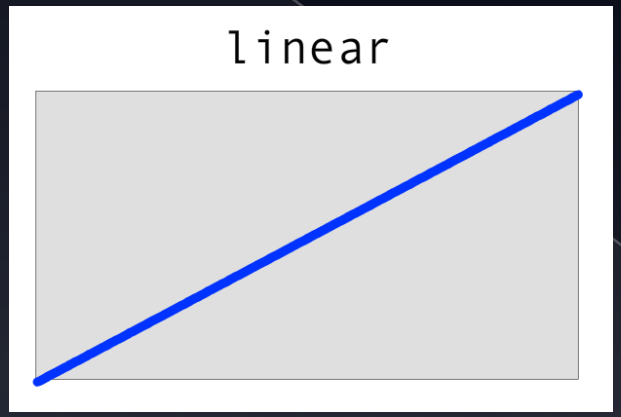
- 起始位置
- 改变量
- 所需时间

变形函数

```
getTweenPosition=function(time, begin, change, duration){
   return position;
}

getTweenPosition=function(t, b, c, d){
   return position;
}
```

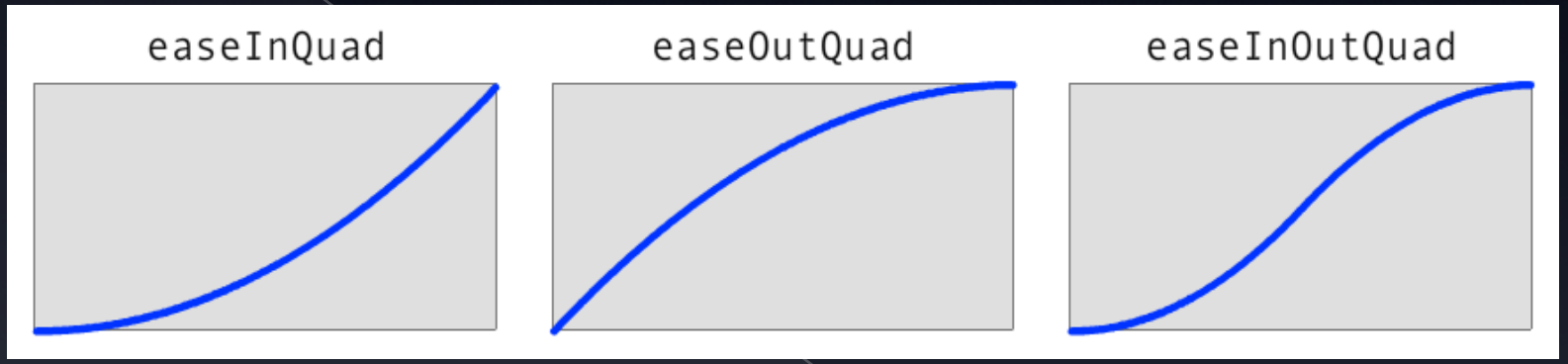
线性变形



$$p(t) = t$$

```
Y.Anim.DEFAULT_EASING =Y.Easing.easeNone =
function (t, b, c, d) {
        return c * t / d + b; // linear easing
};
```

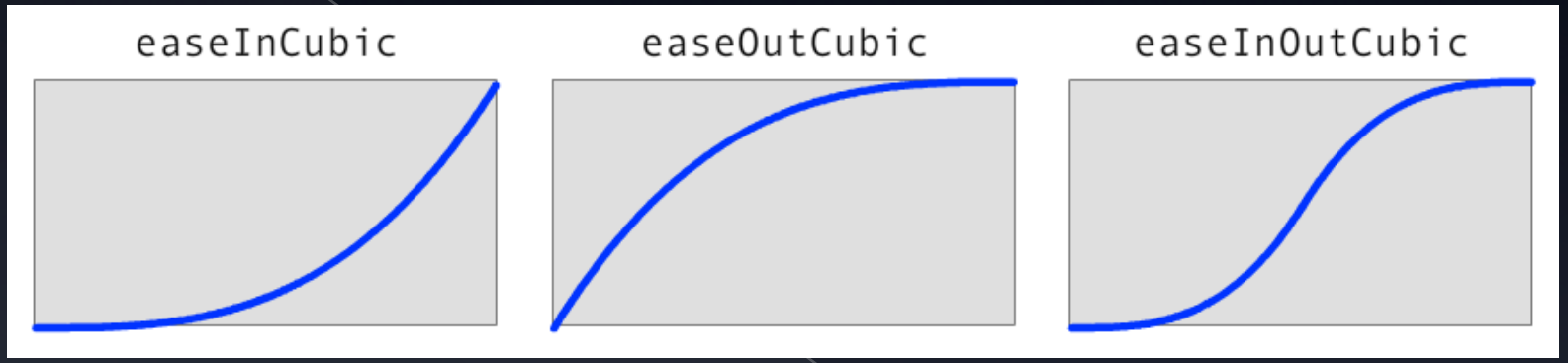
二次缓动



$$p(t) = t^2$$

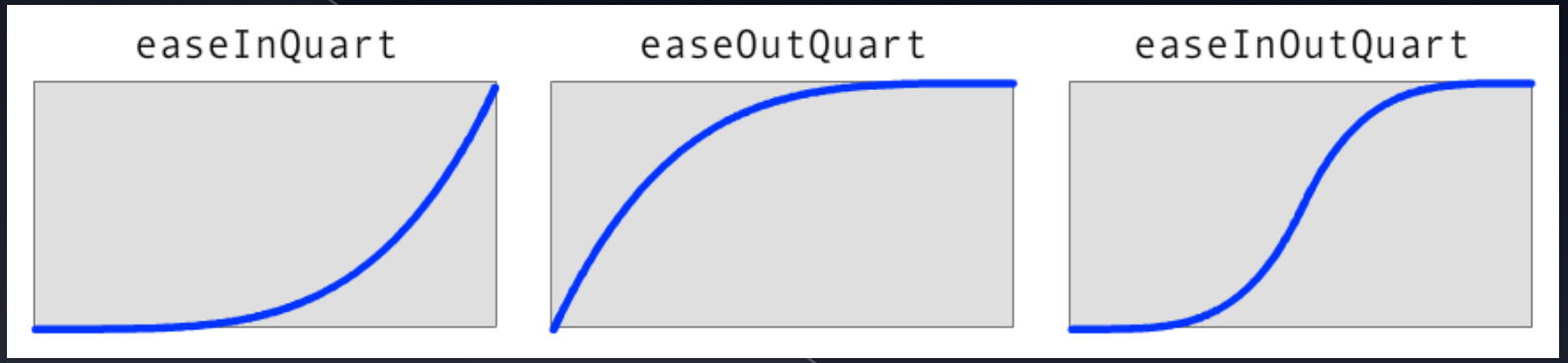
```
Y.Easing.easeIn
Y.Easing.easeOut
Y.Easing.easeBoth
```

三次缓动



$$p(t) = t^3$$

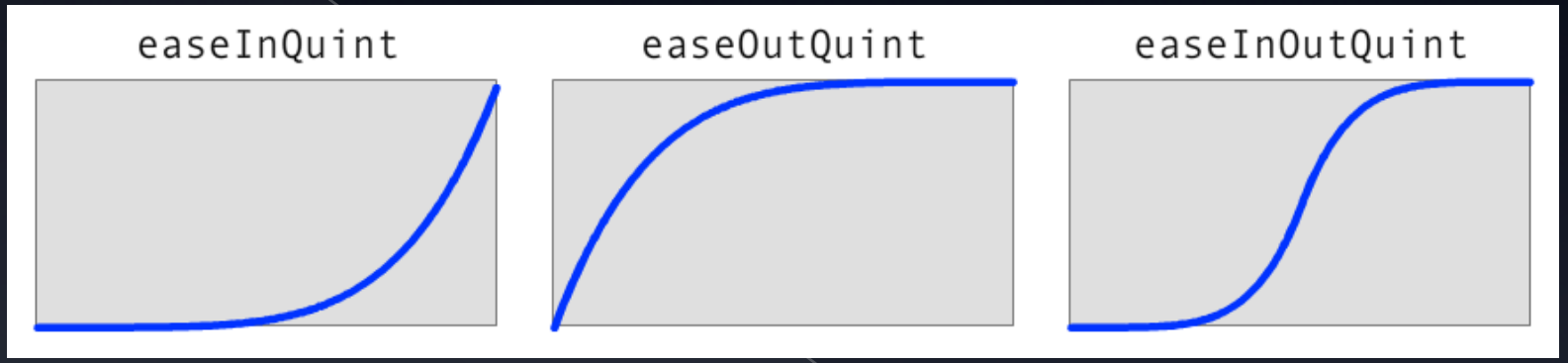
四次缓动



$$p(t) = t^4$$

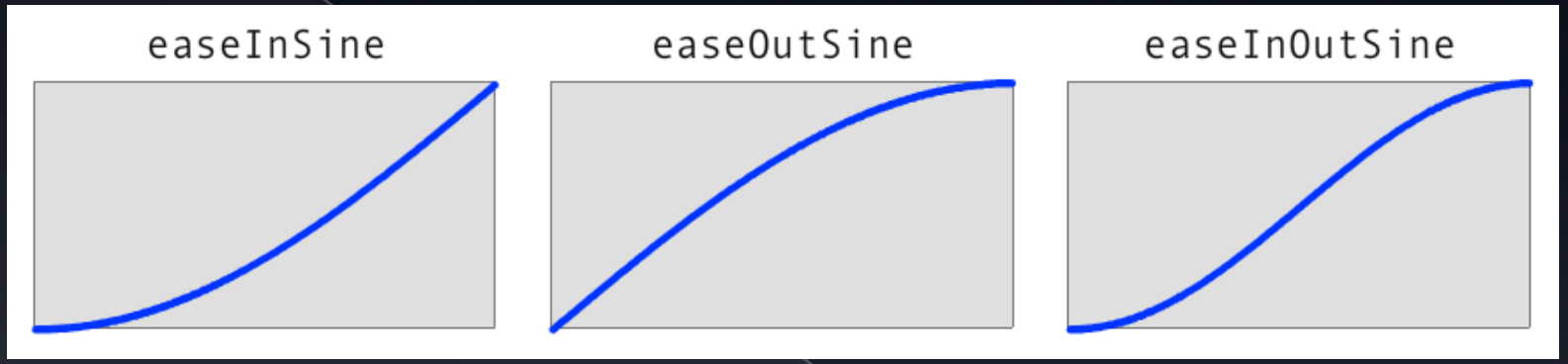
```
Y.Easing.easeInStrong
Y.Easing.easeOutStrong
Y.Easing.easeBothStrong
```

五次缓动



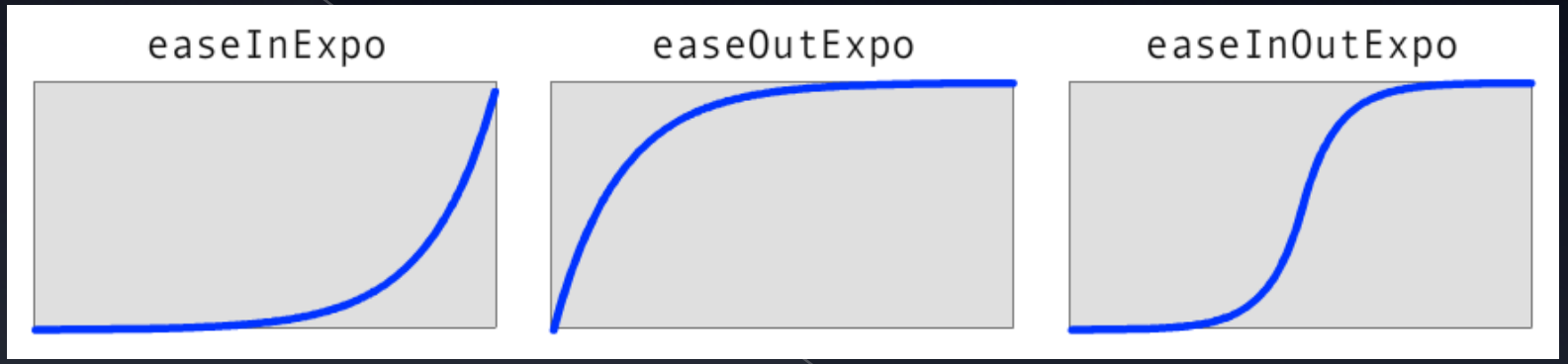
$$p(t) = t^5$$

正弦缓动



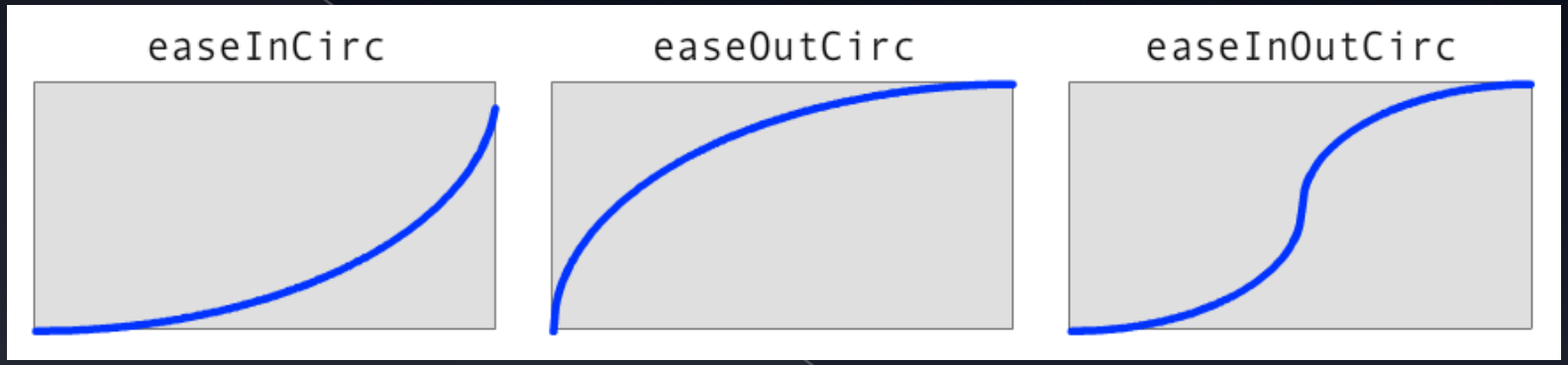
$$p(t) = \sin(t \times \pi/2)$$

指数缓动



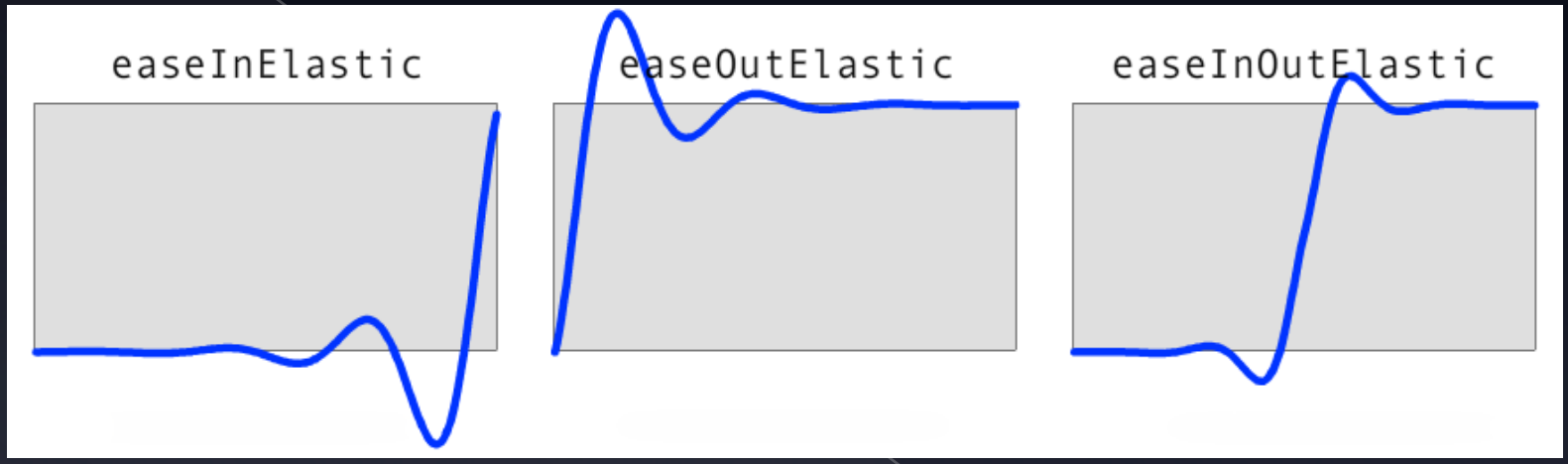
$$p(t) = 2^{10(t-1)}$$

圆形缓动



$$p(t) = 1 - \sqrt{1 - t^2}$$

弹性缓动

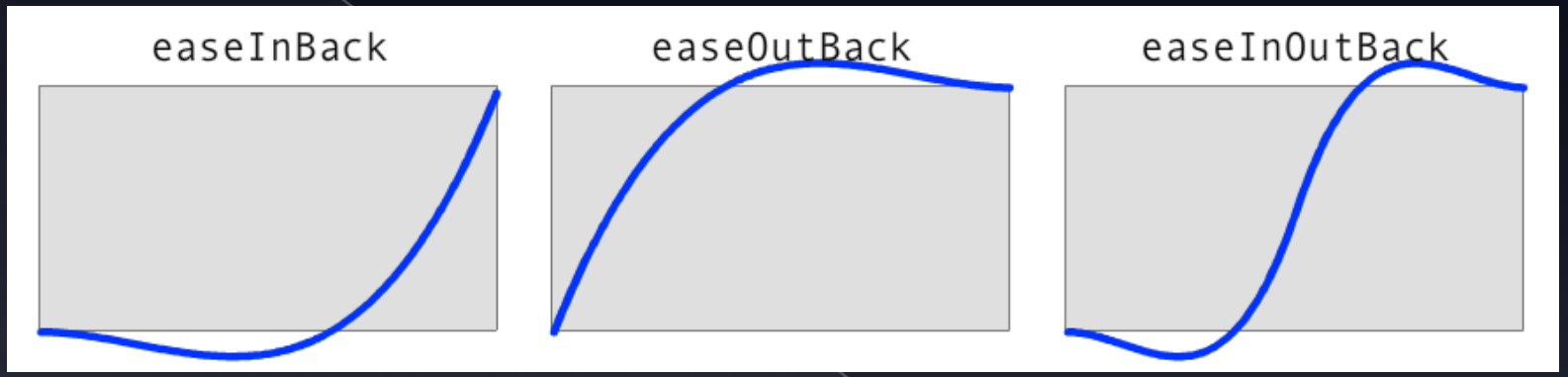


$$p(t) = A \times 2^{10(t-1)} \times \sin((wt-s) \div p \times \pi/2)$$

Y.Easing.elasticIn
Y.Easing.elasticOut
Y.Easing.elasticBoth

Amplitude & Period

回退缓动

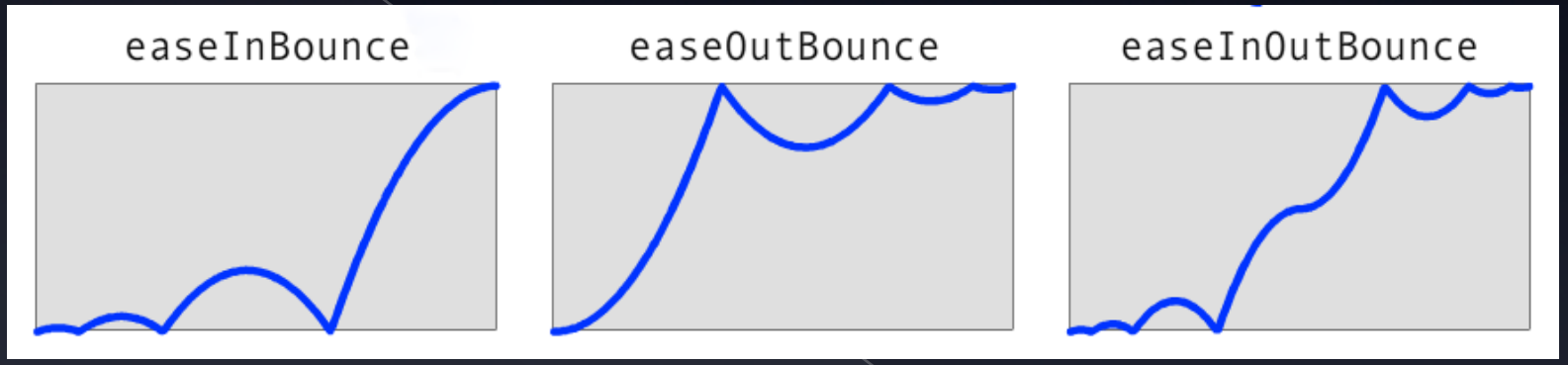


$$p(t) = at^3 + bt^2 + ct^1$$

Y.Easing.backIn
Y.Easing.backOut
Y.Easing.backBoth

Overshoot

弹跳缓动



$$p(t) = t^2$$

```
Y.Easing.bounceIn
Y.Easing.bounceOut
Y.Easing.bounceBoth
```

Thank